Yi 2
7397
F 4

Animal heat continued.
of Respiration — 156.
of Coughing — 174
— Sneezing — 175
— Yawning 176
— Laughter 177
— Crying — 178
— Voice & Speech 179

V ✓ I object to it, because we often
find the Skin cold, ~~but~~ while the blood
~~and no bound pulse~~ flows as usual
thro the blood vessels, & we also find
the Skin warm while the pulse is
~~Dr DeHaan found it perfectly natural in a~~
weak or imperceptible. Now if heat
~~person in an hysterical~~ depends on the friction of the blood
~~-ness of the circulation of the blood~~
against the blood vessels, it would be
in some ratio to the force or weakness
of its circulation. Indeed this is
so far from being the case, that a limb
when deprived of its principal artery
by the Operation for the Aneurism
is often warmer after the loss of the
artery than it was before. — Dr DeHaan
tells us he found a paralytic arm in a cold ch
the pulse was natural.

by this action upon each other. IV

2 by I shall object to this ~~hypothesis~~ theory, that the blood does not move with sufficient velocity thro' the Arteries to produce that degree of heat which we perceive in the body. But Dr Martin who defends this ~~hypothesis~~ theory, says that the increase of surface in the Arteries compensates for the diminution of velocity in the blood. But allowing the diminution of the velocity of the vessels to be equal & proportioned to the diminution in the velocity in the small vessels; yet still the Dr's ~~theory~~ hypothesis may be overthrown by the following facts.

viz: that in vessels of the same size near the heart, & in the aorta

V & I object to it because the heat of a
limb to which is deprived of its principal
Artery is often greater after the Loss
of the Artery that is was before]

has suggested a 4th cause of animal heat the
IV. by Dr Cullen supposed the heat of the body
to be the effect of its vitality, & ascribed it
to what he called a vital principle which
he supposed to be seated principally in the
nervous system. As we I Do not admit the
existence of a vital principle, I cannot of
course admit of ~~the~~ D. Cullen's theory
of the cause of its animal heat.

All these theories have yeilded to
one first suggested by Dr Black, and

extremities, the blood moves with very different velocities, and yet not=withstanding this, we find the heat of ~~the body exactly~~ nearly the same in every part of the ~~body~~. body. ⸗

a third supposition which has been proposed to account for animal heat is, that it depends upon the action of the different particles of blood upon each other in the blood vessels. A single exp: will refute this opinion. Waters, or any other fluids if agitated ~~every~~ ever so long in a vial never produces a single particle of heat. The collision of the particles of the ~~fluid~~ fluids ~~is certainly~~ much less than that of the blood globules. ⸗

~~extended, and improved by the labors~~
~~of many ingenious chemists.~~ I
shall briefly give you a detail of the
mention
I shall first ~~detail~~ ~~this theory with~~
~~all~~ the facts on which this theory is
founded, and then mention the objections
to it, ~~and~~ and endeavour afterwards
to ~~reconcile~~ it ~~=~~ facts & arguments to
shall
which it is founded, and then
them mention a number of
~~endeavour to answer~~ the objections.
~~That have been made to it.~~ to it.

~~It belongs~~ belongs to Chemistry to
have suggested the only rational
theory of the Nature of Heat, and to
the illustrious Dr Black to have led
the way for those inquiries, and
experiments which have conducted us
to this theory.

In order to explain this theory it will
be necessary to remark that there are various
modes of exciting heat. The only one that
I shall consider is by means of Combus-
tion such as goes forward in a culinary
fire.

This phenomenon was sup-
posed for a long time to be occasioned
by the discharge of a principle called
Phlogiston, and by means of the
action of air upon it. This Phlogiston

27 parts of ~~oxy~~ oxygen, 72 of azote
and ~~5~~ one of Carbonic gas. The oxygen
~~oxygen~~ air they say further is a
compound of pure air & a substance
which they call Caloric

is supposed to be the same in all bodies, & transferable by certain chemical processes from one body to another.

~~Some late~~ The experiments by M^r. Lavoisier and other french Chemists have called the existence of this Phlogis=
=ton in Question. They suppose, ~~as the author, that they have proved~~, that the principle which produces combustion does not reside in the burning body, but in the Air which acts upon it. —
This Air they say is a compound body consisting of Atmospheric Air and dephlogisticated Air - 1/3 - or 1/4 of the latter, and 3/4 or 2/3 of the former with a small portion of carbonic gas perhaps. — The dephlogisticated Air they say is a compound
= ther, is composed of pure Air, and

a substance which they call caloric, by which they mean the matter, or principle of heat. — ~~Combustion they~~ These facts being admitted, Combustion they say is occasioned in the following manner. The body to be inflamed being first heated, the air rushes upon it and undergoes a decomposition. The pure air is absorbed by the burning body - the caloric is set at liberty, and hence the the production of ~~big~~ heat - & light. The air which is unconsumed after losing its Dephlogisticated air is ~~ren~~ endued unfit to support ~~flame~~ fire any longer. - It even extinguishes flame. It is in this State called phlogisticated or azotic air.

Exactly the same proofs go, ~~as~~ Dr Black supposed went forward in the production of the heat of

v more animate exp^ts of Dr Irwin ~~40~~ cubic inches
& Dr menzies ~~60~~ 40 — in Dr heat cubic inches
of 60°. — It ~~did~~ expands to 43 in
the lungs.

† It is 111° in birds who have the very
we know have large lungs in prop^n
to y^r Size. It is in a low Degree in
all of which have small lungs &
fish — insects & reptiles who consume
but little air in respiration. It is
~~of cold~~ in a low degree in the toad — for w^ch
reason yᵉ Turks informs us in his travels
into Spain that the Spanish Ladies sometimes
carry them in their bosoms in order to allay
the heat of this bodies in hot weather.

the human body. — we all carry a fire
~~To day~~ it has been said about with us, and the chimney
which contains it is seated in the lungs.
The ~~uncertain~~ facts which are addduced to support this theory,
are as follow[s].

= 2 The Quantity of Air consumed in respi=
=ration - said to be 14 cubic inches according to Dr Goodwin in each
inspiration. — but according to V
The absolute necessity of Air to Animal
life. — has been brought in from p: 149 =
3 ~~Animal~~ Animal heat being in proportion to
the Quantity of Air consumed in respi=
=ration, & the fire of the lungs in proportion
to other parts of the body. —
4 The change produced in the Air is
discharged from the lungs being ex=
=actly the same as that which is produ=
=ced, in Air robbed of its ~~pure or Dephlo=~~
=gisticated Air, and Caloric or matter of
heat by the combustion of a body. The
Air we expire is true phlogisticated

azotic

6 From the ~~phlogisticated~~ air which is discharged from the lungs being
lesp. warm according to Dr Crawford than pure
~~dephlogisticated~~ oxygen air which is taken
into the lungs.

7 From the arterial ~~blood~~ blood on
which the ~~dephlog.~~ oxygen air acts, first being
warmed by 1° 0 1/2 according to the same
Author) than venous blood it is
as 11 - 0 1/2 to 10. — by Mr Hunter's, and
thermometer it was 99 in the right 97 in the
left Ventricle of a Dog being for this purpose by
Mr Coleman.

or Azote —
Air — it extinguishes flame, and
is fatal to Animals. ——

5 From the effects a Pharmomen ch
appears in the ~~blood~~ body after
the action of ~~Oxygen~~ Vital Air upon it. This
Air changes produced a red color in
many bodies with which it combines —
such as red lead: and Colcothar of
Vitriol ~~It~~ and hence procured with
Salt petre — for this Salt abounds with
dephlogisticated or oxigen
Air. Now the red Color
of the blood is supposed to be derived in
like manner from the action of this
Air upon it. It is certain it is much
redder in the pulmonary vein, than
in the pulmonary Artery, after the Air
has acted upon it. And redder in an
adult than in a fœtus ch who has not breathed.

One

I know of but Objections to this theory,
& that is the heat of a Phlegmon or of
any local inflamn: at a distance from the
lungs. It appears in this instance to be
connected with the action of the vessels, &
to be wholly unconnected with respiration
or the internal air. Perhaps in the
groups of inflamn: there may an oxidication
or be a conversion of latent into sensible heat
of caloric from the air which I shall say
hereafter enters into the composition of
the blood. This is rendered the more proba-
ble from the decomposition or new
Arrangement of the particles of the blood which takes place
in Phl inflamn: - now the alteration
the texture or consistency of bodies we know
in many cases evolves latent heat. Perhaps
The Objections to this theory of
animal heat are the action of air

From the analogous effects of ~~dephlog~~ air upon a burning body, and upon the lungs. The more of this air that can be applied to a burning body, the more vivid its flame, and the greater its heat. ~~its heat~~ - In like manner, the more of this air that is received into the lungs: the greater the generation of heat; hence the increased heat of a the body after exercise - and in a fever.

* It is a striking proposition, in the ~~words~~ logic said that heat of the human body; that it is the same in all climates & in all seasons — Many theories have been proposed to account for it. Dr Crawford supposes that absolute heat & phlogiston are two opposite principles

upon the blood ~~=~~ part of the body imparts no heat to it. That it acts upon it we infer from its giving it a red color.

2 The heat of the body is but 1°. greater in the lungs than in the remote parts from them — now were the lungs the first place in which heat was produced, there would it be a greater sensation of it than in the extremities.

3 There is often a morbid Coldness, or burning in the extremities; now this could not take place if heat were generated only in the lungs, — for heat would certainly follow its law of a constant tendency to an equilibrium in living as well as dead matter.

4 There is often great heat in inflamed parts remote from the lungs. From

in ~~proportion~~ & that ~~is proportionate~~ when phlogiston
is added to any body, its capacity of contai-
~~the one is augmented~~ =ning absolute heat is diminished, &
that when phlogiston is abstracted from
the same body, its capacity of receiving
absolute heat is augmented. hence the
heat of the body is generated from
rising above ~~its~~ its natural standard in summer &
~~rising too high~~, or falling below
its ~~natural~~ standard in winter. This hypothesis in the ingenious
writer. — ~~But the discussion of the~~
is ~~question~~ overthrown by the discoveries of
the French Chemists which exclude
Phlogiston from the human body,
in common with other combustible
matters. —

It is easy to conceive why the
body will always maintain the

this: & the ~~a~~ arguments before mentioned, it would seem as if the generation of heat was carried on at the same time, and ~~by the same means~~ in every part of the body. see other objections to it, but pass'd in Dr Hutchinson's Thesis p 22–23.

Let us endeavours to account for the production of animal heat by the extension of Dr Black's theory. Let us suppose the Oxygene rec'd into the lungs to be decomposed there in part, and that after mixing with the blood, it is conveyed by it into every part of the body, & decomposed by entering into Union with those parts wch are formed or nourished by the blood. Two things favour this conjecture. 1 all bodies in passing from an aerial, to a fluid, or from a fluid to a solid

same temperature in winter from the means which produce heating so exactly the same. But why does not the body rise with the heat of the Air to 100° and even 120 & 130°.

It has been common to Answer this Question in Summer? by saying — the fat discharges or exhalation from the lungs by sweat are always proportioned to the degrees of heat to which the body is exposed, — now evaporation whether of sweat, or water always produces cold — and this probably reduces the system to its natural Standard of 96°. —

However prudent nature may seem to be in maintaining a

heat. Flow

form, emit a portion of ~~it~~ the
Oxygen w^ch circulates with the blood
passes from ~~both~~ both aerial and
~~a fluid~~ a fluid form when it enters into
composition of those solid parts of
fluid &
~~which~~ the body of which ~~it is~~ it is
~~first~~ a component part. This
is derived from our aliment,
as well as from the air.
appears from its being detected in
the human Calculus ÷ Urine &
fat — in the form of the Lithic
Acid — ~~Phosphorus~~ & the Acid of
the Acid of
fat — How these Acids are probably
the Oxygen
derived from ~~the~~ ~~food~~ taken
into the Lungs — for its very name
implies that it is of an Acid nature
Return to p. 143 ÷ 90
This opinion ~~is~~ ~~indeed~~ ~~still~~ ~~most probably~~ is
the seat of perfect
~~Oxygen~~ ~~acidus~~ ~~is~~ ~~found~~ ~~in~~ ~~part~~ ~~of~~ ~~the~~ ~~Bile~~ ~~&~~ ~~under~~
~~formed probably by the decomposition of the air on the lungs~~
take either theory, the solution
in nearly the same — They both lead

led
~~tooptod to~~ inquire whether the
Author of Nature has left it to the sole operation
~~Causes which produced it~~ ~~were~~
of the causes I have mentioned to produce
~~at all times sufficient for that~~
it, and whether there are no means
~~purpose~~. — ~~If they should not,~~ —
appointed to obviate such obstructions
~~there are other causes which occasion~~
as may occur from
~~chiefly to apply their Observations~~ to its being performed in
a regular and perfect Manner. ~~Certain~~
~~deficiency.~~ — ~~those are the Organs of~~

coughing - Sneezing - Yawning - ~~Crying~~
panting — Hiccups —
and Laughing & Crying. Each of which

I shall explain in order.

When the Lungs become impacted by
Phlegm, - mucus, - or extraneous Sub-
-stances received into them, ~~by inspiration~~,
the action of the Air upon them is im-
-peded, & the circulation of the blood
thereby
mechanically Obstructed by the prepare

// Of these ~~cases~~ matters upon the blood
In this case
vessels, — ~~the~~ the action of Coughing takes place
~~which~~ Coughing is a convulsive motion attended
with deep inspirations & expirations &
& quick alternate
~~and~~ together with a concussion of the
abdominal muscles, all ~~of which~~ con-
-cur to expel the offending matters from
the lungs, and to restore the circulation
of the blood. — The phaenomena I have men-
-tioned occur most frequently in
the decline of life, and in cases of
universal debility, ~~of this~~ hence
the Tupis Senilis or the Old mans
Cough which is so notorious that an
old man is never hoot on the Stage with-
-out it — and hence too the origin &
use of the Cough in the pulmonary

V place from another part of the body.

consumption. Death would be the consequence
of its suspension for a few days. Unless a discharge took V
Sneezing consists of one deep &
full inspiration followed by a sudden
& violent convulsive expiration. It is intended to
serve nearly the same purpose as Coughing
in the animal economy, - viz to expel
stagnating mucus & the like, from
the lungs, and all the passages which
lead to them thro' the nose. Sneezing
is frequently a premonitory symptom
of a Catarrh. - It occurs in the
debilitated state of the lungs which
precedes the inflammatory action of the pul-
monary vessels, in that disease, and it never fails
for a while to remove the mucus & other matter
which accumulate in the lungs in

consequence of the predisposing debility of the Catarrh. — Yawning likewise occurs about the crisis of certain fevers, and is always a favourable sign as it shows sensibility & excitability to be revived in the lungs, the

~~[illegible]~~

Yawning is attended with a full & deep inspiration, a gaping of the mouth, the upper limbs are often stretched at the same time. It seems to accelerate the circulation not only thro' the pulmonary vessels, but thro' the veins which convey the blood thro' the lungs into the left Ventricle of the heart. It occurs at those times when persons are fatigued, ~~by [illegible] of the body exercised~~ — as in

V Panting urges the passage of the
blood thro the lungs by numerous quick and short
acts of inspiration & expiration. It
serves to send the blood more speedily
to the Left Ventricle of the heart after
great exercise - also to propel the blood
thro the lungs when it is disposed
to stagnate - in certain diseases
of the breast. V

V Hence two the propriety of comic representa-
=tions being exhibited only in the evening
I shall say hereafter it has Oftimes per-
=formed great Cures in certain diseases.

O I remarked formerly that Dis
gave the first impulse to life in Adam when
his Creator breathed into his lungs the breath
or breaths of life & that same stimulus begins

late in the evening ~~17~~ 26
~~the morning~~, or after attending to
tiffling
a long, and ~~dry~~ discourse. — It seems
just after waking
likewise in the morning when the
system is still in the debilitated and
languid State which is induced by
sleep. V

= Laughter consists of many short
quick
and imperfect acts of inspiration, &
expiration, by which means the agita-
tion of the lungs is much greater
than in ordinary respiration. When
moderate, it conduces to health. It is
most necessary in the evening — and
the evening
hence ~~the morning~~ has
been appropriated by civilized nations
as where to those festive pleasures
of which Laughter composes a part.

the actions of life in a new born child. The
air rushes into its lungs — it first impulse
gives pain — hence it cries — this adds to
the stimulus of the air in setting the ma-
=chine of life in motion — nor do the lungs
cease for years afterwards to be the bellows
of life — hence

the debility of grief, or the depression of joy,
hence the relief persons who are under the influ-
=ence of either of them, feel from the shedding
of tears. —

=tion in imparting motion to every other
parts of the body, Until by repetition
they are to associated with the action
of Respiration as to become habitual.
The necessity of all these artificial or morbid

Hickups is a violent deep - ~~and~~ convulsive and ~~sudden~~ inspiration attended with a noise. — It occurs frequently after ~~indigestion~~ immoderate laughter, and seems to remove the debility which is induced by it. It occurs likewise in the lowest stages of certain fevers.

Crying is attended first with a deep inspiration, - then a number of short alternate acts of inspiration & exspiration - afterwards with one deep expiration, and one large inspiration. - It is wisely & kindly intended to remove the languor in the circulation of the blood in the lungs which is induced by

Thus we see pain, speedily pleasure in this
= disposed to cry, before they laugh. They
as in other instances.
~~children~~ ~~they~~ shed tears in crying in infancy.
~~The~~ some degree of
mind must concur to produce the
secretion & discharge of tears. This first
Acts of emotions are without choice.

go back to p 177

of which

Hermit of Engadde

V I shall pass over a ~~dissertation~~
~~I must inform you that~~
of the anatomical structure of the
parts which are employed in both
these exercises. You will receive
it with more advantages from the
Anatomical Chair. — go to p: 181 x

= Aids to Respiration is evident from its
being so disposed to cease when children sleep
upon very soft beds, or sleep without moving.

~~direct~~ the debility of grief - or the ~~indirect~~ dyspepsia debility of joy - hence the relief peo-
feel strain shudding tears
-ple, who are under the influence of
deep
~~either~~ grief - or ~~great joyful tears~~
shedding tears ~~_____~~ immoderate

go back to ① p 177

joy. In Children crying is merely related
to Coughing - hence they ~~sometimes~~ often at seem
to Having imagined & explained the
~~go back to 177~~ motions of the breast in Respiration,
and their various Uses in the Animal
Oeconomy, we proceed next to treat
of two Actions intimately connected
with it, ~~with~~ viz:
Lect.
Voice - and Speech. -
And here Gent: I cannot help observing
that if I aimed at the character of a
profound & accurate Physiologist, I would

=From the absence of stimulus they the blood stagnates in their lungs, & hence they start - and instantly scream, or cry, & thus restore the circulation of the blood in their lungs, and with it all the functions of life. — go back to p 179 ff

introduce this subject first by describing
the Structure of the trachea and Larynx
the glottis ~~the together with the~~ Pharynx - tongue -
nose and Lips. I would ~~mention the~~ in a more
especial manner dwell upon
the ~~Cartilages the muscles and the liga-~~
Structure of
~~ments which compose~~ the Larynx.
I would fill your ears with the high
sounding terms of its thyroid - Cricoid -
Arytenoid cartilages with its
epiglottis - I would describe each of
the ligaments which connect these car-
tilages together, and then proceed to
mention the muscles which move them.
Such as the Sterno thyroideus - Hyo-
thyroideus - Crico-Arytaenoideus Pos-
ticus - Crico-Arytaenoideus Lateralis -

Thyro-Arytaenoideus - Thyro-epiglottideus
-Arytaenoideus Obliquus & Arytaeno-
-Epiglottideus. But Gent: I am willing
to give up all the learned character I should
acquire by such descriptions, and
shall content myself with the humble
satisfaction of having aimed to teach
you such things only as are useful
and intimately connected with the knowledge of
the profession
of Physic. I conceive Physiology to be
to Anatomy, what philosophy is to
natural history. — They both suppose
the objects on which they treat to be
discovered and known — and the business
of the former as much as the latter is only
to unfold principles

V I shall only remark here that by spending a princi-
=pal part of my course in these minuty ~~& profound~~
but familiar anatomical descriptions; I should save
myself the labor of much thinking, & the Deliver myself ch.
from the necessity of deciding on many controversies, on w:
I would have preferred a prudent Silence or neutrality. -

By Voice I mean sound emitted
from the mouth whether
in ballowing - singing - laughing - or
Speech.. By Sound I mean certain
tremors or vibrations of solid bodies excited
by impression made upon them by
other bodies, and which are afterwards com-
-municated to the ear by the medium of the air: To
this an[2] of Sound there is the exception of Sound
being conveyed to deaf people thro the medium
of wood - and several metals. -

≠ ~~Still worse deaf~~ The frontal - Sthenoid
& maxillary sinuses afford some aid to
the voice of a similar nature.

It is explain the laws and Operations
which govern the ~~[illegible]~~ world

briefly
The parts which are employed in
forming the Voice are the tracheal
Glottis I say nothing of Epiglottis as
the Larynx and Glottis
it only closes the Glottis in eating & drinking. The Voice
is encreased in its strength & rendered more clear & agreeable by
its passage thro' the ~~[illegible]~~ throat and
mouth. These perform Dr Monroe used to say, the
office of the sounding board of a pulpit.
Physiologists have been divided in
their opinions whether the structure
forming
of the organs employed in
the Voice
resembles a wind - or a chorded instru
=ment - or whether they are compound
upon the compound principles of
both of them. The last opinion
is the most general One [It was

~~[illegible], But I am [illegible]~~
~~[illegible] it, and [illegible]~~ inclined to believe that ~~[illegible]~~ the Voice is produced ~~[illegible]~~ exactly in the same way that Sound is produced by a Wind instrument. My reasons for this Opinion are as follow.

1 The Strings of a corded instrument of music, for example a Violin when stretched to a great degree as to be tuned, always emits a Sound when struck by the bow - but the Sides of the glottis ~~are~~ (which are supposed to be most analagous to the cords of a Violin) when stretched to their highest degree of tension, and afterwards struck ~~[illegible]~~ the by a solid body emit no Sound, nor

We come next in order to treat of

Respiration

I remarked formerly that it was at first altogether involuntary, and that it became both voluntary & involuntary from habit. In consequence of this change it may be accelerated or retarded and even suspended for a while at our pleasure, but in general it goes on as at birth in an involuntary manner without any consciousness or act of the will. How is it is performed? What are its causes, and what are its uses in the Animal Oeconomy? — I shall attempt in the present

Lectures, to answer each of these Questions.

Respiration Consists of two parts, viz
Inspiration & exspiration. For a descrip-
-tion of each of them I shall refer you
to books particularly to Dr Cullen's little
tract upon Physiology. I shall only make
a few remarks upon the lungs.
1 In proportion to their Utility & necessity to the
Health & life of Animals, they are removed
at a distance from Sight & from injuries.
2 They Contain according to M^r Ruish's Calculation
the greatest number of Lymphatics next
to the Liver of any Viscus in the body &
for wise purposes to be mentioned here-
-after. They are seen most readily by
inflating the Lungs of a new born infant

Air.

3. The pulmonary Artery is supposed to convey nourishment to the lungs. Dr Haighton infers this from the in=
=jections paping from it to the membranes which is formed upon the lungs, and which becomes Vascular by inflam=
=mation.

4 The lungs popes but a small portion of Nerves in proportion to their Quantity of matter. They consist of the Anterior and posterior pulmonary Nerves, and of some small branches from the recurrent Nerve, and of the Cardiac plexus which enter together with the blood vepels. Hence the lungs popes but little

Sensibility, and ~~was~~ not as much insi=
=tability as ~~was~~ formerly supposed.
This most sensible part is the Bronchia.
Many facts concur to prove the lungs
to be endowed with but little sensibility
and irritability. These are inflammations,
~~Deposteration~~, Depsceated Abscesses, Ulcers,
and tubercles and even water existing in the lungs
without exciting any pain.
2 Dr Monro has proved by many ex=
=periments upon the lungs of living
animals, that they possess but little
sensibility. I know it may be said
that these experiments are not conclu=
=sive, inasmuch as the lungs of
an animal while under the

lancing knife of an Anatomist, may have its sensibility so far destroyed or suffocated by pain as to discover no marks of it in ~~the muscles~~ Sensation or motion. It has been said further that parts which discover but little sensibility or irritability in health, show signs of both when diseased. This is true, but the remark does not apply to the question before us, for I am now considering the physiology of the lungs only in their healthy state in which case they are possessed of but little sensibility or irritability. This insensibility and want of exquisite irritability are wisely and kindly given to the lungs

in order to defend them and the whole body as far as it is dependant upon them for health from primary diseases, particularly from those which arise from the innumerable particles of irritating matters which float in the Air - from the extremes of heat and cold ~~of~~ d of moisture and dryness. ~~a~~ - from particles of food and Drink which escape in swallowing into the trachia thro the Glottis, from loud and long speaking and Singing, and from the effects of contusions, and other acts of Violence to which they are constantly exposed. were the lungs otherwise formed, they would probably be the principal Avenue of Disease & Death.

the should / if I may be allowed the ex-
-pression) die, every day of our lives.

3 The Sensibility ~~&c~~ & irritability of the
lungs are in different proportions to
each other in different periods of life.
In infancy & childhood irritability pre-
-dominates over sensibility, and for wi-
-sely wise purposes. The
support of animal life in those
early stages of existence renders an
excess of irritability necessary, and useful, while
the safety and health of the lungs are
intimately connected with their low
state of sensibility at those periods when
the absence of reason prevents children guar-
-ding them against the numerous

~~Object of the Nerves~~

I have said the brain proper but a small portion of nerves in proportion to their size, — hence they are less dependant upon the brain than several other of the viscera. This is obvious from their performing their office in an easy & natural manner, when every other part of the body is disorganized, & in the grasp of death — nay more when the brain itself is in most diseased state — still further, when the brain & head are removed from the body. This has been lately proved in France & by Dr Brodie in Great Britain. After cutting off the head of a dog, he kept him alive two hours & ½ by inflating

Sources of diseases that have been men-
-tioned. In youth & middle life the
proportions of sensibility & irritability
in the lungs is nearly equal, but
in old age, the latter predominates over
the former, and for the same reasons
that were given for its excess in infancy
and Childhood. V

4 Those parts of the lungs which are
exposed to the Air including the trachia,
and the minute branches of the Bronchia
are said to be equal to the whole Surface
of the body.

5 No two persons have exactly the same
number of inspirations & expirations
in a minute.

6 There are generally three or four

his lungs with a pair of bellows. =

Strokes of the radial Artery to One complete
Act of respiration - but this proportion
varies in different people. It is moreover
varied by Disease. It is likewise different
in different Animals.

There is a greater dilation of the Thorax
in inspiration in Women, than
in Men - for the wise purpose of fa-
-vouring Gestation. It appears in the
infancy & Childhood of the female sex.

We proceed next to inquire into the
Causes of Respiration. These are

1 An Uneasiness in the breast which is felt
after every Act of inspiration & exspiration,
that stimulates to a repetition of the same
Actions. In exspiration the lungs are
compressed, and the blood retarded in
its passage from the right Ventricle

thus admitted into the lungs,
V this fluid ^ many important
advantages are derived in the Animal
Oeconomy. / It serves =

of the heart to the left, or from the
pulmonary, to the Aortic System of
blood vessels - ~~from the heart~~ But Unea-
sily ~~does~~ not only takes place in expiration,
but ~~inspiration~~ likewise from the
vessels being overstretched in inspiration.

A 2nd cause of respiration is the stimulus
of the Air taken into the lungs in
every act of inspiration. The Air acts
probably not only by its obvious Mec-
hanical but by its decomposition.

~~Let us~~ Let us in the last place attend
to the uses of Respiration. They are
1 To admit Air into the lungs, from
~~which~~ to impart the first and most
powerful Stimulus to the body in the
production of animal life. I took notice
formerly that not only heat, but motion

sensation and thought were prostrated by it in our progenitor Adam, and that it gave the first impulse to life in all the Children that came into the World.

The Air

2 ~~[illegible]~~ which is taken into the lungs is thereby decomposed & becomes one of the causes of animal heat.

3 ~~[illegible]~~ It imparts by its oxygen a red color to the blood.

4 ~~[illegible]~~ a certain portion of it is probably mixed with the blood. I say a certain portion only, for an undue quantity induces Disease & Death. Dr Bi- -chat injected a quantity of air into the lungs of a dog, and then tied up the trachia. The dog became agitated: He then opened

One of the Arteries of his leg, from which
a number of Air bubbles issued mixed with
blood. He performed the same experiment
with Hydrogen gas. The Gas took fire
when discharged from the leg of the
Dog. Dr Hartshorn injected Air into the
femoral Artery of the Dog. It did him
no injury. He injected it gradually.
Take notice of these facts. I shall here-
=after mention some Others which
show Air to be present at all times
in a qualified state in our blood, and
I shall I hope explain the cause of
several Diseases from it. Take notice
further that Dr Hartshorn injected the
Air gradually into the femoral Artery
of the Dog. Many Stimuli applied both

internally & externally in a gradual
manner are inactive ~~on~~ & inoffensive,
which produce disease & death when
applied suddenly. The air when received
into the blood probably puts of some
of its natural properties while the body
is in health, but assumes them in
disease. So necessary does a portion of
it seem to be in the blood, that it is
thought to be conveyed into it from
other sources when its passage natural to it is
obstructed by a disease in the lungs.
This is made highly probable by
experiments made by Dr Beddoes. He
injected a quantity of atmospherical air into
the cellular membrane of a dog, and
found it completely absorbed in the course
of 20 days. He afterwards injected oxygen

V I have only to add under this head, the lower it weaken the circulation of the blood, the less Air is required for the purpose of Respiration. a dog that was bled Until the pulsation of his Artery was imperceptible, lived four minutes & 1/2 under Water, while another dog in good health, lived ~~upon~~ only two minutes in the same element.

into the cellular membrane which was instantly absorbed & produced great activity in the Animal.

5th Lastly Air in its oxygenous state is received into the lungs by means of respiration in order to impart irrita-
-bility to the muscular fibres in every part of the body. The heart & Arteries beat but 60. in a minute in a fœtus in Utero, but it beats 120 strokes in the same time as soon as it inhales Air into its lungs. I do not say that the irritability of the muscular fibres is derived exclusively from the Oxygen taken in by the lungs. It is likewise derived from our aliments & Drinks. V

A 2nd use of Respiration is to convey a

a certain portion of moisture which is absorbed by the Lymphatics of the lungs in order to mix it with the blood for certain necessary purposes in the Animal Oeconomy.

3 Respiration serves to convey out of the body thro' the Channel of the lungs, certain Matters which are of an Offensive Nature to the System. These Matters are Azotic Air, commonly called Nitrogen, & Carbonic Acid & Water. This Water has been supposed to be formed by the Union of Hydrogen & Oxygen in the lungs, but several facts render this improbable. ~~3xx~~ ounces & 1/4 of an ounce of Water according to Dr Hales are discharged from the lungs in the Course of 24 hours, which are 4/5th more than is absorbed by

them in the same time. The Quantity & Quality of the Matters discharged from the Lungs are much influenced by the Quality and Quantity of Drinks taken into the Body, also by Season, Age & exercise. climate

The Matters discharged from the Lungs in expiration have been the Subjects of many experiments. It extinguishes flame & is fatal to Animals. It is Specifi= =cally lighter than Common Air - hence a Candle is Sooner ~~extinguished~~ extinguished, and an Animal dies Sooner ~~suffocated~~ than in the Upper part of the Vessel that contains it. Young Animals, particularly Mice live longer in it than such as are full grown. Take notice of this fact. I shall apply it hereafter in Speaking of the Signs of Life

and death in Children. Further, an Animal lives longer in ~~the~~ this Air when it gradually phlogisticates it, than when it is suddenly exposed to it. This fact will admit of an extensive application when we come to treat of the effects of Miasmata upon the human body. Animals die in the fixed or Noxious Air or Matters which are discharged from the lungs. ~~in fixed Air~~. They live five times as long in Oxygen, as in common Atmospheric Air, and when they die in it, they suffer much less pain than when they die in Air that has been vitiated, that is, in Azotic or phlogisti-cated Air.

I have said there are three or four pulsations of the Artery at the wrist, to one Act of Respiration. This Slowness of respiration compared with the frequency of the pulse is happily calculated to give

V is required for the purpose of Respi-
=ration. A Dog that was bled until
the pulsations of his Arteries was
imperceptible, lived four minutes
& 1/2 under Water, while another
Dog in good health lived, but two
minutes in the same element.

If the Uses of Respiration are so
numerous & important, we are
naturally led to inquire, whether our
maker has left it to the sole Operation
of the Causes that have been mentioned,
to produce it, and whether there are any means
appointed
to Novviate such obstructions as may
occur to its being performed in a regular
manner. ~~I answer~~

the Azotic Air which is discharged from the lungs time to rise (which it does from being Specifically lighter than common Air) so far above ~~the~~ the mouth & Nose as to prevent this being inhaled into the lungs. I have said that a portion of Carbonic Acid is exhaled from the lungs with Azote or Nitrogen. Perhaps this acid is intended to defend the breath from the Azote, or Nitrogen passages in a simple state, & perhaps a fatid breath is caused by the absence of this Carbonic Acid Gas from the matters discharged in Respiration.

I have only to add upon this subject, that the lower and weaker part of our circulation of the blood, the lip Acid

V It moreover excites a flux & reflux
in the blood, so that it is alternately
impel towards the extremities of the
veins, and afterwards impelled towards
the heart with additional force, as into
an empty space. It is remarkable,
Respiration is performed with the
most force (tho' not frequency) in Sleep,
when the circulation of the blood stands
in most need of it from the Abstraction
of so many of the other Stimuli which
support life. This force is so great in
some people as to be accompanied with
the emission of Sound from the lungs
called Snoring.